Risk factors of type 2 diabetes and excess risk of stroke in patients with diabetes

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I Hedén Stahl C, Novak M, Lappas G, Wilhelmsen L, Björck L, Hansson P-O, Rosengren A. High-normal blood pressure and long-term risk of type 2 diabetes: 35-year prospective population based cohort study of men.
BMC Cardiovasc Disord. 2012;12:89. http://www.biomedcentral.com/1471-2261/12/89

II Hedén Stahl C, Novak M, Hansson P-O, Lappas G, Wilhelmsen L, Rosengren A. Incidence of Type 2 diabetes among occupational classes in Sweden: a 35-year follow-up cohort study in middle-aged men.
Diabet Med. 2014;31(6):674-80.

III C. Hedén Stahl, M. Lind, A-M. Svensson, M. Kosiborod, S. Gudbjörnsdottir, A. Pivodic, M. Clements, A. Rosengren. Long-term excess risk of stroke in people with type 2 diabetes in Sweden according to blood pressure level: A population-based case-control study
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IV C Hedén Ståhl, M Lind, A-M Svensson, S Gudbjörnsdottir, A Mårtensson, A Rosengren. Glycaemic control and excess risk of ischaemic and haemorrhagic stroke in patients with type 1 diabetes: a cohort study of 33,453 patients
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ABSTRACT

The incidence of type 2 diabetes is increasing worldwide, mainly because of increasing life expectancy and changes in lifestyle. However, several other factors may also increase the risk of type 2 diabetes and their importance at a longer follow-up are not well explored. People living with diabetes have an increased risk of stroke but there are still gaps in knowledge about the excess risk at different risk factor levels. The first purpose of this thesis was to explore two risk factors for type 2 diabetes, high-normal blood pressure and low socioeconomic position defined by occupation, based on data from the Multifactor Primary Prevention study in Gothenburg. The second aim was to estimate the excess risk of stroke in people with type 2 diabetes in respect to their blood pressure level and in people with type 1 diabetes in respect to their metabolic control measured by HbA1c. For these studies, data on people with diabetes were collected from the National Diabetes Register and the excess risk of stroke was compared to controls from the general population.

Out of 7494 middle aged men in Gothenburg examined in 1970-1973 and followed until the end of 2011, 13% had a registered diagnosis of diabetes mellitus at any time. Men with systolic blood pressure 130-139 mmHg (high-normal blood pressure) at the screening examination had a 43% increased risk of developing diabetes compared to men with systolic blood pressure below 130 mmHg. Men in the lowest occupational class had a significantly increased risk of diabetes compared to men in the highest occupational class even after adjusting for stress and several other risk factors for diabetes. The conditional probability of developing diabetes after 35 years taking death attributable to other causes into account was 43% in the lowest occupational class compared to 23% in the highest occupational class.

As a group, people with type 2 diabetes had an increased risk of stroke compared to the risk of the general population. When the risk was estimated at different blood pressure levels, the increased risk of ischemic stroke at all blood pressure levels was offset by a significant reduced risk of hemorrhagic stroke at lower blood pressure levels. Therefore people with type 2 diabetes and a blood pressure below 130/80 mmHg had a risk of stroke comparable to the general population.

The risk of stroke was increased for people with type 1 diabetes in all HbA1c categories compared to the general population. However, the risk rose from 75% excess in risk for people with type 1 diabetes and good metabolic control to an eightfold excess in risk for the least well controlled group. HbA1c was more important as a risk factor for ischemic compared to hemorrhagic stroke in people with type 1 diabetes.

In conclusion, this thesis showed that high-normal blood pressure and low occupational class remain as risk factors for type 2 diabetes even after an extended follow-up into older ages. People with type 2 diabetes and low blood pressure have a risk of stroke comparable to the general population. The thesis also underlines the importance of assisting people with type 1 diabetes in every possible way to maintain a good metabolic control in order reduce the risk of stroke.

Keywords: type 2 diabetes, type 1 diabetes, stroke, high-normal blood pressure, occupational class, blood pressure, glycemic control

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